

Glycemic Index and Athletic Performance

Key Points:

- Glycemic index is a measure of how rapidly a carbohydrate is absorbed into the bloodstream
- The glycemic index of foods can be used to determine proper fuel choices for athletes
- Glucose has the highest glycemic index of all foods

Complex carbohydrates are a vital nutrient for energy production in the human body by providing glucose, the body's main energy currency. Carbohydrates are a diverse group of nutrients; they are contained in many plant-based foods and have varying effects on the body's energy levels. Carbohydrates affect energy levels based on how rapidly they can be absorbed into the bloodstream, or the speed at which they raise blood sugar. This is referred to as the glycemic response. The rate at which a carbohydrate is broken down into its most simple unit, glucose, determines the glycemic response. Glucose directly fuels the muscles, brain and nervous systems of athletes at all stages of exercise (before, during, and after). The quicker a carbohydrate becomes glucose, the faster blood sugar will rise.

The glycemic index is a scale that categorizes the glycemic response of a carbohydrate or other type of food. The glycemic index (GI) is based on a numerical scale between 1 and 100. Foods are classified as having a low, moderate or high glycemic response based on where they fall on the scale. The glycemic index can be used to gauge how a certain food, or combinations of foods, will affect blood sugar and thus energy levels.

The GI of a food is determined by measuring blood glucose levels for two hours following ingestion of a 50 gram serving of food, and then comparing these numbers to that of pure glucose, which is the standard for all GI comparisons (glucose is assigned a 100 on the GI scale). For instance, a food with a GI of 65 will raise blood sugar only 65% as quickly as pure glucose. Higher GI foods will raise blood sugar more quickly and to a greater extent than lower GI foods. Higher blood sugar means that more insulin will be secreted, pulling the glucose into working muscles and organs providing them with energy.

Following exercise, a high GI food will lead to greater storage and replacement of glycogen (the storage form of glucose) in the muscles and liver.¹ High GI foods are nearly always preferable for athletes. Prior to exercise, consuming high GI foods will rapidly infuse the blood stream with needed energy.² In order to sustain energy levels and blood glucose levels during exercise, periodic ingestion of high GI foods will keep blood glucose at adequate levels in order to sustain energy. And, following exercise high GI foods are preferred in order to maximally replace the energy stores (glycogen) that were utilized during the event. Low to moderate GI foods are recommended when the need for rapid

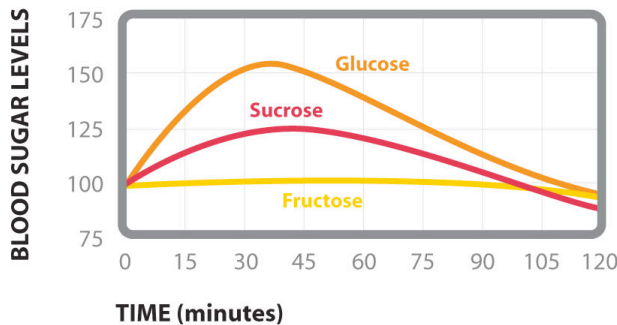
¹ Burke LM, Collier GR, Hargreaves M. Muscle glycogen storage after prolonged exercise: effect of the glycemic index of carbohydrate feeding. *J Appl Physiol.* 1993;75:1019-1023.

² Sherman, W.M. (1991). Carbohydrate feedings before and after exercise. In: D.R. Lamb and M.H. Williams (eds.) *Perspectives in Exercise Science and Sports Medicine*, Vol. 4: Ergogenics: Enhancement of Performance in Exercise and Sport. Indianapolis: Benchmark Press, pp. 1-34.

energy infusion is low, such as during mealtimes when all the other nutritional needs of an athlete are being met.

The glycemic index can be utilized by athletes to determine how rapidly an energy source such as glucose can be absorbed into the bloodstream.

In a recent study of changes in blood sugar concentrations over time, glucose is clearly the best source of energy throughout sport. The high GI of glucose means that it enters the body rapidly providing nearly instantaneous insulin response and entry of the sugar into the cells, providing quick energy. Products with lower GI's (that contain sucrose or fructose, for example) enter the blood more slowly, and are slower to raise insulin, thereby delaying entry of the sugar into the cells and use in the energy cycles.



Changes in Blood Sugar Concentrations Over Time

Blood sugar curves of glucose, sucrose and fructose are representative of the average blood sugar levels that resulted from the ingestion of each type of sugar in a group of subjects. Glucose is the best source of energy before, during & after sport.

Source: Barker J. Glycemic Index comparison study of glucose, sucrose and fructose. Gleukos Performance Laboratories, Portland, Oregon, January 2006.

Glycemic Index of Various Carbohydrates²¹

Glucose (Gleukos)	100
Fructose	12
Sucrose	65
Lactose	43
Honey	48
Orange juice	57
Soda	63

Glycemic index of Various Sports Drinks²¹

Gleukos	100
Gatorade	89
XLR8	68
Powerade	65
Cytomax	62
Allsport	53

Online document at: <http://www.glycemicindex.com/>

²¹ Ibid

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Gleukos Key Points:

Glucose, the main ingredient in Gleukos, is the most rapidly absorbed carbohydrate into your bloodstream, delivering energy to your cells and muscles.